

WHAT IS CLAIMED IS:

1. A downflow condenser, comprising:

an upper horizontal manifold having a near end and a far end,
separated by an upper baffle;

5 at least one first tube having a first end and a second end, connected
at the first end to the near end of the upper manifold;

a lower horizontal manifold having a near end and a far end, connected
at the near end to the at least one tube at the second end, wherein the near
end of the upper manifold, the at least one first tube and the near end of the
10 lower manifold are in a vertical relationship, and comprise a first pass;

a lower baffle in the lower manifold, separating the near end and the far
end of the lower manifold;

at least one second tube having a first end connected to the far end of
the lower manifold, and a second end connected to the far end of the upper
15 manifold, wherein the lower manifold, the at least one second tube and the
upper manifold are in a vertical relationship, and the far end of the lower
manifold, the at least one second tube and the far end of the upper manifold
comprise a second pass,

wherein fluid entering the upper manifold and the at least one first tube
20 cools and condenses into the lower manifold, the lower baffle in the lower
manifold allows only liquid to enter the second pass, and the liquid enters the
second pass and leaves through the far end of the upper manifold.

2. The condenser of Claim 1, further comprising an inlet connected to the near end of the upper horizontal manifold and an outlet connected to the far end of the upper horizontal manifold.

5 3. The condenser of Claim 1, wherein the lower baffle is selected from the group consisting of a depressed portion, a leak path, and a bypass baffle.

10 4. The condenser of Claim 1, further comprising a dryer inside the condenser.

15 5. The condenser of Claim 1, further comprising extended surfaces on the exterior of a tube selected from the group consisting of the at least one first tube and the at least one second tube.

 6. The condenser of Claim 1, wherein a nondiscrete refrigerant tube (NRT) comprises at least one pass of the condenser.

7. A downflow condenser, comprising:

an upper horizontal manifold having a near end, a middle portion, and a far end, the near end and the middle portion separated by a first upper
5 baffle, and the middle portion and the far end separated by a second upper baffle;

at least one first tube having a first end and a second end, connected at the first end to the near end of the upper manifold;

a lower horizontal manifold having a near end, a middle portion, and a
10 far end, the near end and the middle portion separated by a first lower baffle, and the middle portion and the far end separated by a second lower baffle, wherein the lower manifold is connected at the near end to the at least one tube at the second end, and wherein the near end of the upper manifold, the
at least one first tube and the near end of the lower manifold are a first pass,
15 wherein fluid entering the first pass and the at least one first tube cools and condenses into the lower manifold;

at least one second tube having a first end connected to the near end of the lower manifold, and having a second end connected to the middle portion of the upper manifold, wherein the lower manifold, the at least one
20 second tube and the upper manifold are a second pass, wherein liquid condenses in the second pass and at least partially falls into the lower manifold, and wherein the first lower baffle passes only liquid to the middle portion of the lower manifold;

at least one third tube having a first end and a second end, connected at the first end to the middle portion of the upper manifold and the second end to the middle portion of the lower manifold, wherein the middle portion of the upper manifold, the at least one third tube, and the middle portion of the lower manifold comprise a third pass;

at least one fourth tube having a first end and a second end, connected at the first end to the far end of the lower manifold and at the second end to the far end of the upper manifold, wherein the far end of the lower manifold, the at least one fourth tube, and the far end of the upper manifold comprise a fourth pass;

wherein the second lower baffle passes only liquid to the far end of the lower manifold, and the liquid enters the fourth pass and leaves through the far end of the upper manifold, and wherein the upper manifold, the tubes, and the lower manifold are in a vertical relationship.

8. The condenser of Claim 7, further comprising extended surfaces on the exterior of at least one tube selected from the group consisting of the first tube, the second tube, the third tube and the fourth tube.

9. The condenser of Claim 7, wherein the first and the second lower baffles are selected from the group consisting of a depressed portion, a leak path, and a bypass baffle.

10. The condenser of Claim 7, further comprising a dryer inside the condenser.

11. The condenser of Claim 7, wherein any pass comprises a
5 nondiscrete refrigerant tube (NRT).

12. The condenser of Claim 7, wherein at least some of the liquid condensed in the first pass is entrained into the second pass.

10 13. The condenser of Claim 7, wherein all the fluid from the first pass enters the second pass, and the first lower baffle passes no fluid to the middle portion of the lower manifold.

14. A method of cooling refrigerant using a downflow condenser,
15 comprising:

providing a downflow condenser;

introducing gaseous refrigerant into a first pass of the condenser;

condensing the gaseous refrigerant into a liquid, so that only liquid
refrigerant passes a lower bypass baffle of the condenser and enters into a
20 second pass of the condenser;

subcooling the refrigerant in the second pass, and

removing liquid refrigerant from the condenser.

15. The method of Claim 14, further comprising drying the refrigerant.

5 16. The method of Claim 14, wherein the condenser is a four-pass
downflow condenser, the gaseous refrigerant condenses into a liquid in a first,
second and third pass of the condenser, gas does not enter the fourth pass of
the condenser, and subcooling of the refrigerant takes place in the fourth
pass.

10 17. The method of Claim 14, wherein a first lower baffle separates the
second pass from the third pass, and a second lower baffle separates the
third pass from the fourth pass.

15 18. The method of Claim 14, further comprising drying the refrigerant.

 19. The method of Claim 14, wherein a nondiscrete refrigerant tube
(NRT) comprises at least one pass of the condenser.